Human-like problem-solving abilities in large language models using ChatGPT

Abstract

Backgrounds The field of Artificial Intelligence (AI) has seen a major shift in recent years due to the development of new Machine Learning (ML) models such as Generative Pre-trained Transformer (GPT). GPT has achieved previously unheard-of levels of accuracy in most computerized language processing tasks and their chat-based variations. Aim The aim of this study was to investigate the problem-solving abilities of ChatGPT using two sets of verbal insight problems, with a known performance level established by a sample of human participants. Materials and methods A total of 30 problems labeled as "practice problems" and "transfer problems" were administered to ChatGPT. ChatGPT's answers received a score of "0" for each incorrectly answered problem and a score of "1" for each correct response. The highest possible score for both the practice and transfer problems was 15 out of 15. The solution rate for each problem (based on a sample of 20 subjects) was used to assess and compare the performance of ChatGPT with that of human subjects. Results The study highlighted that ChatGPT can be trained in out-of-the-box thinking and demonstrated potential in solving verbal insight problems. The global performance of ChatGPT equalled the most probable outcome for the human sample in both practice problems and transfer problems as well as upon their combination. Additionally, ChatGPT answer combinations were among the 5% of most probable outcomes for the human sample both when considering practice problems and pooled problem sets. These findings demonstrate that ChatGPT performance on both set of problems was in line with the mean rate of success of human subjects, indicating that it performed reasonably well. Conclusions The use of transformer architecture and self-attention in ChatGPT may have helped to prioritize inputs while predicting, contributing to its potential in verbal insight problem-solving. ChatGPT has shown potential in solving insight problems, thus highlighting the importance of incorporating AI into psychological research. However, it is acknowledged that there are still open challenges. Indeed, further research is required to fully understand AI's capabilities and limitations in verbal problem-solving.